

THE MULLEIN THRIPS

BY STANLEY F. BAILEY

University of California, Davis

The mullein thrips, *Neoheegeria verbasci* (Osborn), is a common thrips in central Europe and North America. Since 1888 miscellaneous items, both of a taxonomic and biological nature, have appeared on this insect, and it seems desirable to bring them together at this time with such notes as the writer has accumulated. In view of its exceedingly narrow host range it is doubtful that it will ever become of economic importance. It is, however, commonly found in entomological collections, and, since it is often readily obtainable, it is used in teaching as an example of the suborder Tubulifera. Therefore, a discussion of its biology and the illustrations of its various stages and important anatomical characters (Plate I, figures 1-12) may be of some value.

This thrips is a member of the family Phlæothripidae. The genus *Neoheegeria*, established by Schmutz (1909), is not abundantly represented in North America and only a single species, *verbasci*, is known from California. Representatives of this genus are much more abundant in Europe and in the old world. Priesner probably has the largest collection of this group and informs the writer that he will shortly publish a review of the genus with a key to the species.

It is possible that additional species in this genus will appear from time to time in North America and a translation of Priesner's key to European species may be of some aid to other workers. The key, from *Thysanopteren Europas*, 1928, p. 629, follows:

KEY TO EUROPEAN SPECIES OF NEOHEEGERIA

1. Head 1.2 to 1.3 as long as wide.....2
- Head only 1.1 as long as wide, the third antennal segment with two sense cones.....*verbasci* (Osb.)
2. The third antennal segment with only two sense cones.....3
- The third antennal segment with three sense cones. Body bristles long. Tube longer. Fore wings as a rule with 14-17 inter-located hairs.....*dalmatica* Schmutz
3. Fore wings with 10-12 inter-located hairs. Body stout, fore femora thick.....*lederi* Priesner

- . Fore wings with 6-7 inter-located hairs. Body less robust.
Fore femora much more slender.....*johni* Priesner

NEOHEEGERIA VERBASCI (Osborn)

1888. *Phlæothrips* sp., Osborn.
1896. *Phlæothrips verbasci* Osborn.
1902. *Anthothrips verbasci*, Hinds.
1907. *Trichothrips femoralis* Moulton.
1912. *Haplothrips verbasci*, Karny.
1920. *Neoheegeria verbasci*, Priesner.
1928. *Neoheegeria verbasci*, Priesner.

A complete, technical redescription of this common thrips is not necessary (that of Hinds, 1902 and Priesner, 1928 are sufficient.) It will suffice to say that the adult is about 2 mm. in length. The body is shiny black to the unaided eye and the wings (fig. 12) folded on the dorsum form a silvery white Y. Segments 3 to 6 of the antennæ (fig. 11) yellow and the fore tibia yellow shading to brown at the base. Base of fore wing (including scale) brown; wings narrowed in middle and colorless.

The egg (fig. 2) is oval in shape, translucent white to pale yellow in color and about 0.377 mm. long without surface reticulations. The larva (figs. 1 and 3) is lemon to orange-yellow, often nearly a burnt-orange in color in mature individuals with the antennæ and tip of abdomen brown. The pupæ (figs. 4-6) are a pinkish-orange to salmon pink in color; the appendages are colorless. Both mature larva and pupa are about the same size as the adult.

For a full technical description of the immature stages see Priesner (1928), pp. 632-634.

HOSTS

The chief host plant of *N. verbasci* is mullein (*Verbascum thapsus* L.). In central Europe Priesner records five additional species of *Verbascum* as hosts—namely, *austriacum*, *lychnitis*, *nigrum*, *phlomoides*, and *phœniceum*. Other host records found in the literature from North America include corn, cherry, ceanothus, and black-eyed daisy. (On one occasion an adult found its way into the stomach of a trout.) These plants are doubtless transitional hosts, for reproduction takes place only on mullein. Attempts made by the writer to rear this thrips on other plants have failed. It can be seen that the host plant range is extremely narrow and perhaps entirely restricted to *Verbascum*. Hood (1917) states that it “feeds exclusively on mullein.”

DISTRIBUTION

This species is one of the most generally distributed of the phlæothripids. Priesner reports it generally over the whole of Central Europe up to 1400 meters (about 4600 feet) and specifically from Austria, Hungaria, Roumania, Balkan States, and England. Bagnall (1933) states: "In my experience the species becomes more common on the continent as one goes south-east and the genus has many representatives in south-eastern Europe and in India."

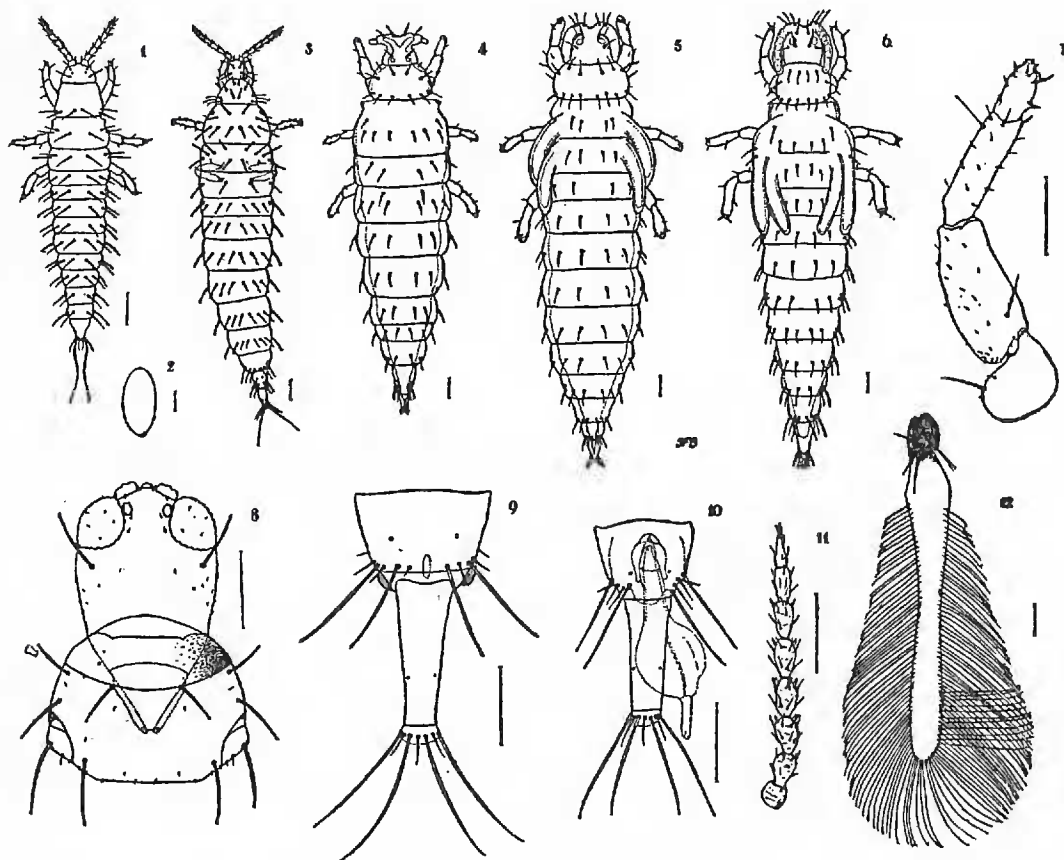
Aside from one record from Ontario, Canada, *N. verbasci* is known from the following states: California, Florida, Georgia, Indiana, Illinois, Iowa, Kansas, Maryland (and D. C.), Massachusetts, Michigan, Mississippi, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Utah, and Washington.

The presence of its host does not always mean the thrips is present, for the writer has collected on this plant in the eastern, central and western states and many times failed to find it. In California it is most commonly distributed in the Mother Lode district of the Sierra Nevada Mountains on the east side of the Sacramento Valley. From the Folsom district east to Emigrant Gap and at Donner Lake, Lake Tahoe, and Reno, Nevada, on the east side of the Sierra, it is very common. Tehama and Lassen counties are its limits to the north, the Sacramento Valley to the west, and Madera County on the south. Extensive collecting on mullein in Lake, Napa and Sonoma counties has failed to show its presence to the west of the Sacramento Valley. Collections from mullein in southern California also have been negative. In "Flowering Plants of California," Jepson states (page 896) that common mullein is found in "flats, valleys, mountain ridges or dry stream beds, nat. from Eur.: very common in the Sierra Nevada Pine belt; North coast Ranges." It is quite possible, then, that this thrips has been introduced from Europe and has not spread as rapidly as its host in North America.

BIOLOGY

The life cycle of the mullein thrips is spent entirely on the host plant. With the exception of the egg, all stages have been found throughout the year in central California during mild seasons at low elevations. At high elevations (about 3000 feet and up to 6000 feet) where the plants are partly or completely

winter-killed, the adults hibernate in the leaves at the base of the plant or in the flower spike which usually remains intact offering good protection. Early in March egg laying begins at low elevations and not until about the first of June at the highest points in its range. Since the host is usually a biennial, reproduction generally begins on the young plants which spring up around the older plants. A colony will remain on an individual plant for two years. The adults appear to migrate chiefly by crawling; they have been observed only rarely to fly. Copulation takes place on the plants in the usual manner.



Neoheegeria verbasci (Osb.): Figure 1, first instar larva; 2, egg; 3, mature larva; 4, prepupa; 5, first stage pupa; 6, second stage pupa; 7, fore leg of male; 8, head and prothorax of male; 9, tip of abdomen of female; 10, tip of abdomen of male, showing genitalia exserted; 11, antenna; 12, fore wing. Lines equal .1 mm.

The eggs are laid loosely among the forked hairs of the basal leaves and in among the flowers on the spike. In the laboratory, where the length of the stages was determined, the egg stage lasts 12 days. The larvæ feed together with the adults on the more tender growing portions of the host away from the direct sunlight. The larval stage extended on the average twenty-eight

days, but at higher summer temperatures is undoubtedly shorter. Pupation takes place among the feeding stages and consumes nine days.

There are two larval instars, a prepupal stage, and two pupal stadia or a total of five stages. Shull (1914, 1917) proved that this thrips could reproduce asexually, unfertilized eggs giving rise to males only.

After the first of June, at which time the first generation is complete, there is a continuous over-lapping, all stages being present well into October. At the lower elevations in California there appear to be three complete generations. The fuzzy nature of the leaf surface makes it difficult for natural enemies to reach the mullein thrips. However, *Triphleps tristicolor* White commonly preys upon *N. verbasci*.

These observations on the biology of the mullein thrips in California coincide with those of Osborn in Iowa and Priesner in Austria. These writers report hibernation taking place on the part of the adults in the seed pods and basal leaves. Osborn observed the eggs as being first laid in April and the first generation completed the last of June with a probable second. Priesner found larvæ and pupæ from May to late fall. The occurrence of individuals in other environments such as in drying corn husks and under willow bark (Priesner, 1928, p. 634) is undoubtedly a matter of chance.

While hundreds of adults and larvæ are often found on a single plant they apparently injure it very little. Osborn (1888) stated that the injury to the leaf showed "as yellow blotches, similar to those produced by *Tetranychus telarius*." A slight browning around the base of the individual flowers in the spike and on the smaller leaves in the basal rosette is the only evidence of injury.

There are about 36 references to this thrips in the literature, many of which give host and distributional records; only the more important and those cited in this paper are listed below.

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NOTE ON A TABANID

In a recent paper by Mr. Allan Stone on the subfamily Tabaninæ of the Nearctic Region (U. S. Dept. of Agric., Misc. Publ. No. 304, p. 28, 1938) the author states that the co-types of *Tabanus dodgei* Whitney are now lost. This species was described from nine females received by Mr. Whitney from Mr. G. M. Dodge of Glencoe, Nebraska. The G. M. Dodge collection, at his death, was left to his brother, E. A. Dodge, later of Santa Cruz, California, and at the death of E. A. Dodge came to the California Academy of Sciences. This collection contains two females of *Tabanus dodgei* labelled Dodge County, Nebraska. They agree in every respect with Whitney's description. These are without doubt co-types that were returned by Mr. Whitney to G. M. Dodge. Glencoe is in Dodge County, but a few miles from the town of Dodge. As the Whitney material seems to have been lost, I have designated one of these specimens as the lectotype of *Tabanus dodgei* Whitney.—E. P. Van Duzee.